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ENGINEERING EXPERIMENT STATION  
of the Georgia Institute of Technology  
Atlanta, Georgia

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STATUS REPORT NO. 34

PROJECT NO. 116 -18

INVESTIGATION OF FUNDAMENTAL PROPERTIES  
OF  
ELEMENTS AND THEIR COMPOUNDS  
INCLUDING  
THE RARE EARTHS AT VERY LOW TEMPERATURES  
WITH  
PARTICULAR EMPHASIS UPON SUPERCONDUCTIVITY

By

W. T. Ziegler

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NAVY DEPARTMENT, OFFICE OF NAVAL RESEARCH  
CONTRACT NO. N6-ori-192, TASK ORDER I  
NR 016-406

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May 1, 1954 to August 1, 1954

ENGINEERING EXPERIMENT STATION  
of the Georgia Institute of Technology  
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TABLE OF CONTENTS

|  | Page |
|--|------|
| I. SUMMARY . . . . .                   | 1    |
| II. LOW-TEMPERATURE RESEARCH . . . . . | 1    |
| III. FUTURE WORK . . . . .             | 2    |
| IV. MEETINGS AND CONFERENCES . . . . . | 2    |
| V. PERSONNEL . . . . .                 | 3    |

## I. SUMMARY

The repair of the hydrogen liquefier, damaged in an explosion, has been completed.

A second purifier has been constructed thus doubling the capacity to purify the high-pressure hydrogen entering the liquefier.

Analysis of the calibration data obtained for three platinum resistance thermometers over the range  $10^{\circ}$  to  $320^{\circ}$  K. has been continued.

It is expected that measurements of the heat capacity of  $\text{La}_2\text{O}_3$  over the range  $15^{\circ}$  to  $320^{\circ}$  K. can be started during the next three months.

## II. LOW-TEMPERATURE RESEARCH

The immediate objective of the present research is the determination of the heat capacities of several rare earth oxides (notably  $\text{La}_2\text{O}_3$ ,  $\text{Nd}_2\text{O}_3$  and  $\text{Pr}_2\text{O}_3$ ) over the temperature range  $15^{\circ}$  to  $320^{\circ}$  K. This objective has required the construction of an adiabatic calorimeter for the heat-capacity measurements and a cryostat for calibrating several platinum resistance thermometers against a standard thermometer calibrated at the National Bureau of Standards.

The adiabatic calorimeter is complete except for the final assembly of the gold-plated calorimeter can. Measurements with the calorimeter have awaited the completion of the calibration of a platinum thermometer for use with the calorimeter.

The repairs of the hydrogen liquefier, damaged by an explosion (see Status Report No. 33 dated February 1 to May 1, 1954), have been completed. The liquefier has not yet been tested.

Status Report No. 34, Project No. 116-18

The explosion referred to above was an indirect result of impurities in the high-pressure hydrogen gas commercially available to us. (The liquefier operates directly from compressed hydrogen in cylinders.) Another purifier, identical with one already in use (ONR contract No. N6-ori-192, Progress Report No. 5, August 1, 1947), has been constructed to purify the hydrogen before it enters the liquefier. This will double the capacity of the purification system.

Analysis of the data obtained for the calibration of three platinum resistance thermometers over the range  $10^{\circ}$  to  $320^{\circ}$  K. has continued.

### III. FUTURE WORK

It is expected that during the next three months' evaluation of the results of the calibration experiments on the platinum thermometers, together with the preparation of resistance-versus-temperature relations, will be completed. It is believed that measurements of the specific heat of lanthanum oxide,  $\text{La}_2\text{O}_3$ , over the range  $15^{\circ}$  to  $320^{\circ}$  K. can be started.

### IV. MEETINGS AND CONFERENCES

Dr. Ziegler plans to attend the National Conference on Cryogenic Engineering to be held at Boulder, Colorado, September 8 - 10, and the Ninth Calorimetry Conference to be held at Schenectady, N. Y., September 17 and 18, 1954. The expenses of these trips will be borne in part by the present project and in part by the Georgia Institute of Technology.

Status Report No. 34, Project 116-18

V. PERSONNEL

The following individuals have been associated with the project during the period covered by this report:

| <u>Name</u>             | <u>Position</u>    | <u>Time</u>  |
|-------------------------|--------------------|--------------|
| Dr. W. T. Ziegler       | Director           | Part time*   |
| Mr. H. A. McGee, Jr.    | Graduate Assistant | Part time**  |
| Mr. W. M. Ligon         | Graduate Assistant | Part time    |
| Mr. R. G. Wooten        | Graduate Assistant | Part time*** |
| Mr. W. D. Bradbury, Jr. | Graduate Assistant | Part time    |

Respectfully submitted:

*W. T. Ziegler*  
W. T. Ziegler  
Project Director

Approved:

*Paul K. Calaway*  
Paul K. Calaway, Acting Director  
Engineering Experiment Station

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\* Half time during July and August  
\*\* Without pay  
\*\*\* Since June 28



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